

# NRG Expert Geothermal Report

## Edition 1, 2011

### Market Intelligence

2010 appeared to be a weak year for geothermal with few projects commissioned and only in existing markets. However, this is not indicative of the state of the sector as a whole. As more money was invested in geothermal last year than the previous year. Several projects are now in the advanced stages of development, e.g. in the US alone there is 722 MW of project in phase 3 and 4, and support for the sector is strong. Specifically, Japan and Indonesia are relaxing rules on developing geothermal projects on protected land, which should open up more sites for development.

Once again the US is the largest country in terms of installed capacity of 3,102 MW followed by the Philippines (1,966 MW), Indonesia (1,189 MW), Mexico (958 MW) and Italy (863 MW). Sixth placed New Zealand is reporting strong growth after a 140 MW geothermal plant was commissioned in the country last year and is now the biggest plant in operation. This is a flash geothermal plant, like the second largest plant - the 117 MW Wayang Windu plant in Indonesia.

However, there are signs of a move towards the increasing use of binary geothermal plants. These plants tend to be used at lower temperature resources. As viable high temperature geothermal sites are being used or are under development and the creation of more viable sites through hydraulic fracturing, known as enhanced geothermal systems (EGS), is not close to full commercialisation. With only two EGS projects in operation, the economics is not fully understood and there are concerns about induced seismicity. An even more innovative idea is the use of underwater geothermal resources for projects, but this would be extremely expensive and a long way in the future.

There are also reports that lithium in geothermal brine could be used to generate additional revenue for owners of geothermal projects. One project such project is under development in the Salton Sea in California in the USA.

## Highlights

Over the next five years high growth markets for the sector are expected to continue to be the top six main markets, Kenya, Iceland, Mexico and South America. For the latter, developers have already been awarded concessions to explore new sites in Argentina, Colombia, Chile and Peru. In the middle of 2010 the Chilean government announced plans to invest up to USD 200 million in geothermal projects and will grant over 170 geothermal concessions over the next two years, which should result in the country installing its first generation plant in the mid-term. Kenya and Mexico and the other six major markets are likely to commission projects in the advanced stages of development. As part of a strategy to raise revenue Iceland is considering exporting electricity to other countries. A feasibility study is being undertaken to build a sub-sea electric cable linking Iceland to Europe to sell electricity generated from geothermal projects to Britain, Norway, Holland and Germany.

Another potential growth market is Japan. The country's geothermal power plants were largely unaffected by the recent earthquake and tsunami unlike the Fukushima nuclear power plant. As both provide base load electricity and Japan has a good geothermal resource.

Australia is also developing geothermal projects, and has several EGS and Hot Sedimentary Aquifer (HSA) projects in the pipeline.

Cost is still a major barrier to the development of projects and access to finance for the exploratory stages is still a challenge.

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## Table of Contents

<b>Geothermal .....</b>	<b>1</b>
<b>1. Executive Summary .....</b>	<b>25</b>
USA .....	26
Philippines .....	27
Indonesia .....	27
Mexico .....	28
Italy .....	28
New Zealand .....	28
Iceland .....	28
Japan .....	28
Other countries .....	29
<b>2. Introduction to Geothermal Energy .....</b>	<b>30</b>
<b>Overview .....</b>	<b>30</b>
<b>Development of geothermal energy use.....</b>	<b>31</b>
<b>Direct low enthalpy use of geothermal energy .....</b>	<b>33</b>
<b>Geothermal Heat Pump (GHP), Ground Source Heat Pumps (GSHP) .....</b>	<b>35</b>
<b>Indirect use of geothermal energy for power generation .....</b>	<b>37</b>
<b>Technology of geothermal power generation .....</b>	<b>38</b>
Dry steam .....	38
Flash Steam .....	39
Binary cycle/Organic Rankine cycle.....	40
Combined-cycle or hybrid plants.....	41
Conventional and hot rocks technologies .....	42
Volcanic Geothermal/Convective hydrotreatment .....	44
Sedimentary Aquifer (HSA).....	45
Hot dry rock/enhanced geothermal systems (HDR) .....	47
<b>Comparison of technologies.....</b>	<b>50</b>
Geothermal energy efficiency .....	52
Combined Heat and Power (CHP) .....	52
Geothermal coproduction from waste water .....	53
Offshore geothermal .....	53
<b>Location of resources.....</b>	<b>53</b>
<b>3. Overview of geothermal energy capacity &amp; utilisation .....</b>	<b>57</b>
<b>Geothermal direct use .....</b>	<b>57</b>
<b>Ground Source Heat Pumps (GSHP).....</b>	<b>64</b>
<b>Geothermal electricity generation .....</b>	<b>73</b>
<b>Geothermal generation growth.....</b>	<b>78</b>
<b>Technology .....</b>	<b>87</b>
<b>4. Geothermal Power Industry .....</b>	<b>90</b>
<b>Overview .....</b>	<b>90</b>
<b>Alterra Power Corporation .....</b>	<b>90</b>
<b>Borealis Geothermal .....</b>	<b>93</b>
<b>Caithness Energy .....</b>	<b>94</b>
<b>Calpine .....</b>	<b>94</b>
<b>CalEnergy.....</b>	<b>96</b>

USA.....	97
Philippines.....	97
<b>Chevron.....</b>	<b>97</b>
<b>Contact Energy.....</b>	<b>100</b>
<b>Enel.....</b>	<b>101</b>
<b>Energy Development Corporation (EDC).....</b>	<b>101</b>
<b>Gradient Resources.....</b>	<b>102</b>
<b>Hot Rock.....</b>	<b>103</b>
<b>Mighty River Project.....</b>	<b>105</b>
<b>Nevada Geothermal Power (NGP).....</b>	<b>107</b>
<b>Ormat Technologies.....</b>	<b>111</b>
<b>Oski Energy.....</b>	<b>115</b>
<b>Panax Geothermal.....</b>	<b>115</b>
<b>Ram Power.....</b>	<b>119</b>
<b>Terra-Gen Power.....</b>	<b>122</b>
<b>US Geothermal.....</b>	<b>124</b>
<b>Enhanced Geothermal Systems (EGS).....</b>	<b>124</b>
AltaRock Energy.....	124
EGS Energy.....	125
<b>Geodynamics.....</b>	<b>125</b>
<b>Geox.....</b>	<b>127</b>
<b>GreenFire Energy.....</b>	<b>127</b>
<b>Rockenergy.....</b>	<b>127</b>
<b>Drilling.....</b>	<b>127</b>
Baker Hughes.....	128
Geothermal Anywhere.....	128
Halliburton.....	128
Iceland Drilling.....	129
Potter Drilling.....	130
Schlumberger.....	131
ThermaSource.....	132
<b>Ground Source Heat Pumps.....</b>	<b>132</b>
Nibe.....	132
Waterfurance Renewable Energy.....	132
<b>Geothermal equipment manufacturers.....</b>	<b>133</b>
<b>Turbines.....</b>	<b>133</b>
Mitsubishi.....	133
Toshiba.....	134
Fuji Electric.....	134
<b>5. Geothermal revenue &amp; costs – generation, construction &amp; equipment sales</b>	<b>136</b>
<b>Revenue from geothermal electricity sales.....</b>	<b>136</b>
<b>Capital costs for building geothermal power plants.....</b>	<b>136</b>
Indirect costs.....	138
Disposal.....	139
Operation & Maintenance.....	139
Cost comparison with other technologies.....	140
<b>Geothermal generation equipment market.....</b>	<b>141</b>

Costs of electricity .....	143
<b>6. Country use and development of geothermal energy .....</b>	<b>147</b>
<b>North America .....</b>	<b>147</b>
<b>Canada .....</b>	<b>147</b>
Geothermal power generation .....	147
Direct Use .....	149
Ground Source Heat Pumps (GSHP) .....	149
<b>Mexico .....</b>	<b>154</b>
Geothermal power generation .....	154
Recent power development .....	154
Geothermal fields .....	155
Geothermal generation plants .....	155
Future developments .....	158
Direct Use .....	159
<b>United States .....</b>	<b>160</b>
Overview .....	160
Geothermal power generation .....	160
The Geysers .....	161
Existing Installations and Active Geothermal Projects in the United States .....	164
Alaska .....	166
Arizona .....	167
Arkansas .....	168
California .....	168
Colorado .....	170
Connecticut .....	171
District of Colombia .....	171
Florida .....	172
Hawaii .....	172
Idaho .....	172
Illinois .....	173
Indiana .....	174
Louisiana .....	174
Massachusetts .....	174
Michigan .....	175
Minnesota .....	175
Mississippi .....	175
Montana .....	176
North Carolina .....	176
North Dakota .....	176
Nebraska .....	176
Nevada .....	177
New Jersey .....	180
New Mexico .....	180
New York .....	181
Ohio .....	181
Oklahoma .....	181
Oregon .....	182

Pennsylvania.....	183
South Carolina .....	183
Tennessee .....	183
Texas .....	184
Utah.....	184
Virginia .....	185
Washington .....	185
West Virginia .....	186
Wisconsin.....	186
Wyoming .....	186
Proposed installations.....	193
Current industry outlook.....	198
Geothermal Resources of the USA.....	199
Ground Source Heat Pumps (GSHP) .....	200
Direct Use .....	203
Industrial process heat.....	204
Space heating .....	204
District Heating.....	205
Fish farming .....	205
Greenhouse Heating.....	205
Cooling and Snow Melting .....	205
Agricultural Drying.....	205
Bathing and Swimming .....	205
Federal Government Programmes / Incentives .....	205
Research & Development .....	212
<b>7. Asia Pacific .....</b>	<b>213</b>
<b>Australia .....</b>	<b>213</b>
Geothermal power generation .....	213
Direct Use .....	220
<b>Bangladesh .....</b>	<b>220</b>
Geothermal power generation .....	220
<b>China .....</b>	<b>221</b>
Geothermal power generation .....	221
Direct Use .....	223
Ground Source Heat Pumps (GSHP) .....	225
<b>Fiji .....</b>	<b>226</b>
Geothermal power generation .....	226
<b>India .....</b>	<b>226</b>
Geothermal power generation .....	226
Direct Use .....	228
<b>Indonesia.....</b>	<b>229</b>
Overview .....	229
Geothermal power generation .....	230
Resource Potential.....	232
Geothermal Plants .....	233
Field development and contractor status .....	236
Geothermal contracts concluded .....	240

Prices .....	240
Regional Autonomy.....	241
Law and Regulation – insufficient legal protection.....	242
Developments in 2006 .....	245
Recent Developments.....	245
Barriers.....	246
Direct Use .....	246
<b>Iran .....</b>	<b>247</b>
Geothermal power generation .....	247
Direct Use .....	248
<b>Israel .....</b>	<b>248</b>
Geothermal power generation .....	248
Direct Use .....	248
<b>Japan .....</b>	<b>249</b>
Geothermal power generation .....	249
Future Prospects.....	252
Government Support.....	252
Barriers.....	254
Direct Use .....	255
<b>Jordan .....</b>	<b>255</b>
Geothermal power generation .....	255
Direct Use .....	255
<b>Korea, People’s Republic of (North Korea) .....</b>	<b>256</b>
Geothermal power generation .....	256
Direct Use .....	256
<b>Korea, South .....</b>	<b>256</b>
Geothermal power generation .....	256
Direct Use .....	257
<b>Kyrgyzstan .....</b>	<b>257</b>
Geothermal power generation .....	257
<b>Malaysia .....</b>	<b>257</b>
Geothermal power generation .....	257
<b>Mongolia.....</b>	<b>257</b>
Geothermal power generation .....	257
Direct Use .....	258
Figure 7-22: Development of Direct Use Geothermal Power in Mongolia, MW	258
<b>Nepal.....</b>	<b>258</b>
Geothermal power generation .....	258
Direct Use .....	258
Figure 7-23: Development of Direct Use Geothermal Power in Nepal, MW.....	259
<b>New Zealand .....</b>	<b>259</b>
Geothermal power generation .....	259
Future Developments.....	263
Direct Use .....	265
<b>Papua New Guinea.....</b>	<b>271</b>
Geothermal power generation .....	271
Direct Use .....	271

<b>Philippines</b> .....	<b>272</b>
Overview .....	272
Geothermal power generation .....	273
Chronology of development of geothermal power in the Philippines.....	273
Geothermal Plants .....	278
Direct Use .....	282
<b>Samoa</b> .....	<b>283</b>
<b>Tajikistan</b> .....	<b>283</b>
Geothermal power generation .....	283
Direct Use .....	283
<b>Taiwan</b> .....	<b>283</b>
Geothermal power generation .....	283
<b>Thailand</b> .....	<b>284</b>
Geothermal power generation .....	284
Direct Use .....	284
<b>Vanuatu</b> .....	<b>285</b>
<b>Vietnam</b> .....	<b>285</b>
Geothermal power generation .....	285
Direct Use .....	285
<b>Yemen</b> .....	<b>286</b>
Geothermal power generation .....	286
Direct Use .....	286
<b>8. Europe</b> .....	<b>287</b>
<b>Albania</b> .....	<b>287</b>
Geothermal power generation .....	287
Direct Use .....	287
<b>Armenia</b> .....	<b>288</b>
Geothermal power generation .....	288
Direct Use .....	288
<b>Austria</b> .....	<b>289</b>
Geothermal power generation .....	289
Direct Use .....	290
Ground Source Heat Pumps (GSHP) .....	290
<b>Belarus</b> .....	<b>291</b>
Geothermal power generation .....	291
Direct Use .....	291
<b>Belgium</b> .....	<b>291</b>
Geothermal power generation .....	291
Direct Use .....	292
Ground Source Heat Pumps (GSHP) .....	292
<b>Bosnia</b> .....	<b>292</b>
Geothermal power generation .....	292
Direct Use .....	292
<b>Bulgaria</b> .....	<b>293</b>
Geothermal power generation .....	293
Direct Use .....	293
<b>Croatia</b> .....	<b>294</b>



Geothermal power generation .....	294
Direct Use .....	294
<b>Czech Republic.....</b>	<b>295</b>
Geothermal power generation .....	295
Direct Use .....	296
Ground Source Heat Pumps (GSHP) .....	296
<b>Denmark.....</b>	<b>296</b>
Geothermal power generation .....	296
Direct Use .....	297
<b>Estonia .....</b>	<b>300</b>
Geothermal power generation .....	300
Direct Use .....	300
<b>Finland.....</b>	<b>301</b>
Geothermal power generation .....	301
Direct Use .....	301
Ground Source Heat Pumps (GSHP) .....	301
<b>France.....</b>	<b>302</b>
Geothermal power generation .....	302
Direct Use .....	304
Ground Source Heat Pumps (GSHP) .....	304
<b>Georgia.....</b>	<b>304</b>
Geothermal power generation .....	304
Direct Use .....	304
<b>Germany.....</b>	<b>305</b>
Geothermal power generation .....	305
Direct Use .....	309
Ground Source Heat Pumps (GSHP) .....	309
New Production Capacity.....	310
<b>Greece .....</b>	<b>310</b>
Geothermal power generation .....	310
Direct Use .....	311
<b>Hungary.....</b>	<b>313</b>
Geothermal power generation .....	313
Direct Use .....	313
<b>Iceland.....</b>	<b>315</b>
Geothermal power generation .....	315
New Production Capacity.....	317
Direct Use .....	319
<b>Ireland.....</b>	<b>322</b>
Geothermal power generation .....	322
Direct Use .....	322
<b>Italy .....</b>	<b>323</b>
Geothermal power generation .....	323
Direct Use .....	327
<b>Latvia.....</b>	<b>329</b>
Geothermal power generation .....	329
Direct Use .....	329

<b>Lithuania .....</b>	<b>330</b>
Geothermal power generation .....	330
Direct Use .....	330
<b>Macedonia.....</b>	<b>330</b>
Geothermal power generation .....	330
Direct Use .....	330
<b>Netherlands.....</b>	<b>331</b>
Geothermal power generation .....	331
Direct Use .....	331
Ground Source Heat Pumps (GSHP) .....	332
<b>Norway .....</b>	<b>333</b>
Geothermal power generation .....	333
Direct Use .....	333
<b>Poland .....</b>	<b>333</b>
Geothermal power generation .....	333
Direct Use .....	334
Ground Source Heat Pumps (GSHP) .....	336
<b>Portugal &amp; the Azores.....</b>	<b>336</b>
Geothermal power generation .....	336
Direct Use .....	338
<b>Romania .....</b>	<b>339</b>
Geothermal power generation .....	339
Direct Use .....	340
<b>Russian Federation.....</b>	<b>342</b>
Geothermal power generation .....	342
Direct Use .....	345
Ground Source Heat Pumps (GSHP) .....	345
<b>Serbia .....</b>	<b>345</b>
Geothermal power generation .....	345
Direct Use .....	346
<b>Slovakia.....</b>	<b>346</b>
Geothermal power generation .....	346
Direct Use .....	347
<b>Slovenia.....</b>	<b>347</b>
Geothermal power generation .....	347
Direct Use .....	348
<b>Spain.....</b>	<b>349</b>
Geothermal power generation .....	349
Direct Use .....	350
<b>Sweden.....</b>	<b>351</b>
Geothermal power generation .....	351
Direct Use .....	351
Ground Source Heat Pumps (GSHP) .....	352
<b>Switzerland .....</b>	<b>352</b>
Geothermal power generation .....	352
Direct Use .....	352
Ground Source Heat Pumps (GSHP) .....	353

<b>Turkey</b> .....	<b>354</b>
Overview .....	354
Geothermal power generation .....	354
Direct Use .....	356
<b>Ukraine</b> .....	<b>358</b>
Geothermal power generation .....	358
Direct Use .....	359
<b>United Kingdom</b> .....	<b>359</b>
Geothermal power generation .....	359
Direct Use .....	360
<b>9. Central America &amp; Caribbean</b> .....	<b>362</b>
<b>Caribbean Islands</b> .....	<b>362</b>
Geothermal power generation .....	362
Direct Use .....	362
<b>Costa Rica</b> .....	<b>363</b>
Geothermal power generation .....	363
Future Development.....	365
Direct Use .....	365
<b>Dominica</b> .....	<b>366</b>
Geothermal power generation .....	366
<b>El Salvador</b> .....	<b>367</b>
Geothermal power generation .....	367
Future Development.....	368
Direct Use .....	369
<b>Grenada</b> .....	<b>369</b>
Geothermal power generation .....	369
<b>Guadeloupe (France)</b> .....	<b>370</b>
Geothermal power generation .....	370
Direct Use .....	370
<b>Guatemala</b> .....	<b>370</b>
Geothermal power generation .....	370
Direct Use .....	372
<b>Honduras</b> .....	<b>372</b>
Geothermal power generation .....	372
Direct Use .....	373
<b>Nicaragua</b> .....	<b>374</b>
Geothermal power generation .....	374
Future Development.....	374
Economic benefits of geothermal energy for Nicaragua.....	375
Geothermal Master Plan for Nicaragua .....	375
Exploration Leases.....	375
Direct Use .....	377
<b>St Kitts and Nevis</b> .....	<b>377</b>
Geothermal power generation .....	377
<b>St Lucia</b> .....	<b>377</b>
Geothermal power generation .....	377
Geothermal power generation .....	378

<b>10. South America</b> .....	<b>379</b>
<b>Argentina</b> .....	<b>379</b>
Geothermal power generation .....	379
Direct Use .....	380
<b>Bolivia</b> .....	<b>380</b>
Geothermal power generation .....	380
<b>Brazil</b> .....	<b>381</b>
Geothermal power generation .....	381
Direct Use .....	381
<b>Chile</b> .....	<b>381</b>
Geothermal power generation .....	381
Direct Use .....	383
<b>Colombia</b> .....	<b>383</b>
Geothermal power generation .....	383
Direct Use .....	384
<b>Ecuador</b> .....	<b>384</b>
Geothermal power generation .....	384
Direct Use .....	385
<b>Peru</b> .....	<b>385</b>
Geothermal power generation .....	385
Direct Use .....	385
<b>Venezuela</b> .....	<b>386</b>
Geothermal power generation .....	386
Direct Use .....	386
<b>11. Africa</b> .....	<b>387</b>
Geothermal power generation .....	387
Direct Use .....	387
<b>Botswana</b> .....	<b>387</b>
Geothermal power generation .....	387
<b>Comoros</b> .....	<b>388</b>
Geothermal power generation .....	388
<b>Djibouti</b> .....	<b>388</b>
Geothermal power generation .....	388
<b>Egypt</b> .....	<b>388</b>
Geothermal power generation .....	388
Direct Use .....	388
<b>Ethiopia</b> .....	<b>389</b>
Geothermal power generation .....	389
Direct Use .....	390
<b>Kenya</b> .....	<b>391</b>
Geothermal power generation .....	391
Direct Use .....	397
<b>Morocco</b> .....	<b>397</b>
Geothermal power generation .....	397
Direct Use .....	397
<b>South Africa</b> .....	<b>398</b>
Geothermal power generation .....	398

Direct Use .....	398
<b>Rwanda.....</b>	<b>398</b>
Geothermal power generation .....	398
<b>South Sudan .....</b>	<b>399</b>
Geothermal power generation .....	399
<b>Tanzania .....</b>	<b>399</b>
Geothermal power generation .....	399
<b>Tunisia.....</b>	<b>399</b>
Geothermal power generation .....	399
Direct Use .....	399
<b>Uganda .....</b>	<b>400</b>
Geothermal power generation .....	400
Direct Use .....	401
<b>Zambia.....</b>	<b>401</b>
Geothermal power generation .....	401
<b>12. Geothermal Manufacturers .....</b>	<b>402</b>
<b>13. Targets, subsidies and incentives .....</b>	<b>406</b>
<b>14. Sources and acknowledgements .....</b>	<b>424</b>

## Tables

Table 2-1: Total geothermal capacity and use in 2010 .....	31
Table 2-2: Worldwide geothermal status .....	32
Table 2-3: Geothermal resource type .....	42
Table 2-4: Description of geothermal resources .....	43
Table 2-5: Key Data and Figures for Geothermal Heat and Power Technologies .....	50
Table 3-1: Summary of regional geothermal use in 2010 .....	57
Table 3-2: Top direct use countries .....	59
Table 3-3: Direct use of geothermal energy by country, 1995 to 2010 .....	59
Table 3-4: Uses of direct thermal energy by type of use, capacity (MW), and utilisation (TJ), 1995 to Q1 2010 .....	62
Table 3-5: Heat Pumps .....	64
Table 3-6: Number of Ground-Source Heat Pumps (GSHP) by major country .....	66
Table 3-7: Sales trend for heat pumps used as a heat source in 8 EU countries* followed by the EHPA .....	67
Table 3-8: Representative GSHP manufacturers in the European Union .....	68
Table 3-9: Annual Number of GSHPs Installed Units in Key European Markets 2003 to 2009E .....	69
Table 3-10: Quantity & Capacity of Ground-Source Heat Pumps in European Union, 2005 to 2009 ..	70
Table 3-11: Top Six Countries Growth 2005 to 2010, Growth Hot Spots .....	74
Table 3-12: Leading countries in electric power generation with a capacity of more than 100 MWe... 75	75
Table 3-13: National and regional geothermal power contributions .....	76
Table 3-14: Geothermal plants commissioned in 2009 and 2010 .....	76
Table 3-15: Geothermal installed power capacity by country, 1990, 1995, 2000, 2005, 2007 2008, 2009, 2010 and 2015 forecast .....	80
Table 3-16: Geothermal plants by technology: units, capacity (MW) and average capacity .....	88
Table 4-1: Calpine geothermal plants .....	95
Table 4-2: Chevron’s geothermal assets .....	98
Table 4-3: Similarities and differences between oil and gas and geothermal .....	99
Table 4-4: Energy Development Corporation’s geothermal projects .....	101
Table 4-5: Hot Rock’s HAS geothermal resource assessments at its Australian site .....	104
Table 4-6: Hot Rock’s geothermal milestones .....	105
Table 4-7: Mighty River Power’s geothermal projects .....	106
Table 4-8: Nevada Geothermal Power’s geothermal projects .....	108
Table 4-9: Ormat’s geothermal projects under construction and under development as of July 2011 .....	113
Table 4-10: Ram Power projects under development .....	120
Table 4-11: Terra-Gen’s geothermal power projects .....	123
Table 4-12: List of geothermal turbine manufacturers .....	134
Table 5-1: Direct Capital Costs, USD per kW installed capacity .....	136
Table 5-2: Costs of conventional geothermal binary cycle power plants in the US .....	136

Table 5-3: Unit cost of power, US cents per kWh .....	137
Table 5-4: Cost comparison of geothermal power, heating and CHP .....	137
Table 5-5: Operating and maintenance costs .....	139
Table 5-6: Capital cost comparisons by technology .....	140
Table 5-7: Geothermal projects funded by the World Bank, 2000 - 2010 .....	145
Table 5-8: Geothermal projects registered under the Clean Development Mechanism (CDM) .....	146
Table 6-1: Average costs for common ground source heat pumps in Canadian provinces, CAD .....	150
Table 6-2: Incentives for ground source heat pumps at the provincial level, as of August 2010 .....	151
Table 6-3: Geothermal power generation plants in Mexico .....	157
Table 6-4: Present and planned geothermal plants in Mexico.....	157
Table 6-5: US geothermal power plants brought on line in 2009 and 2010 .....	163
Table 6-6: Total investment in geothermal in the US, 2009, USD million.....	190
Table 6-7: Geothermal Plants in the USA in April 2011 .....	190
Table 6-8: Ongoing Projects in United States by phase, April 2011 .....	193
Table 6-9: Ongoing Projects by State in US in terms of stage and announced planned capacity additions, March 2011 .....	197
Table 6-10: US geothermal projects with priority status as of June 2011 .....	198
Table 6-11: Approved US geothermal projects as of March 2011 .....	198
Table 6-12: US geothermal heat pump shipments by model type, quantity, revenue and average price, 2009.....	201
Table 6-13: Utilisation of geothermal energy for direct heat in the US (excluding heat pumps) .....	204
Table 6-14: List of geothermal electricity department of Treasury Cash Grant Awardees .....	209
Table 6-15: Overview of state-level geothermal incentives in the US .....	211
Table 6-16: State incentives for geothermal indirect-use, direct-use, and heat pump incentives in the US .....	212
Table 7-1: Synopsis of the applicable legislation currently governing geothermal exploration activities in the various Australian States .....	215
Table 7-2: A summary of Commonwealth and State government grant options currently available to the Australian geothermal sector .....	216
Table 7-3: Grants awarded to companies developing geothermal projects in Australia, as of February 2010 .....	218
Table 7-4: Forecast geothermal development costs in Australia, AUD per MW .....	219
Table 7-5: Utilisation of geothermal energy for electric power generation .....	222
Table 7-6: Total investment in geothermal in China, USD million .....	224
Table 7-7: Utilisation of geothermal energy for direct use (except heat pumps) .....	225
Table 7-8: Geothermal (ground source) heat pumps.....	226
Table 7-9: Future Development Planning and Installation of geothermal plant for 10,000 MW 'crash programme' in Indonesia.....	231
Table 7-10: Indonesia geothermal proven reserves, MW, 1995 to 2005.....	232
Table 7-11: Indonesia geothermal proven reserves, MW.....	233
Table 7-12: Geothermal power generation plants in Indonesia .....	233

Table 7-13: Installed Geothermal Power Plants in Indonesia.....	234
Table 7-14: Numbers of well drilled in Indonesian Geothermal Area during 1974 to 2009 .....	235
Table 7-15: Status of PT PLN projects as of December 2010.....	236
Table 7-16: PLN's ESC prices .....	241
Table 7-17: Geothermal power plant development projects .....	243
Table 7-18: List of geothermal working areas that have ready to be offered through bidding process in Indonesia.....	244
Table 7-19: List of existing geothermal power plants in Japan.....	250
Table 7-20: Installed renewable energy capacity accredited under the RPS law in Japan as of July 2010 .....	253
Table 7-21: Historical Changes in NZ Geothermal Electricity Generation Capacity.....	261
Table 7-22: Projects under development in New Zealand.....	262
Table 7-23: Geothermal systems identified in New Zealand .....	263
Table 7-24: Assessment of geothermal potential in New Zealand .....	264
Table 7-25: Utilisation of geothermal energy for electric power generation in Papua New Guinea ...	271
Table 7-26: Utilisation of geothermal energy for electric power generation in the Philippines .....	276
Table 8-1: Geothermal power plants in Austria.....	289
Table 8-2: Utilisation of geothermal for direct heat .....	295
Table 8-3: Utilisation of geothermal energy for electric power generation in France .....	302
Table 8-4: Geothermal power plants in Germany.....	306
Table 8-5: Status of geothermal projects in Germany .....	306
Table 8-6: Utilisation of geothermal energy for direct heat in Greece .....	311
Table 8-7: Geothermal power generation plants in Iceland.....	316
Table 8-8: Utilisation of geothermal energy for electric power generation in Iceland.....	317
Table 8-9: Projects in development in Iceland.....	318
Table 8-10: Utilisation of geothermal energy for direct heat in Iceland .....	321
Table 8-11: Geothermal power generation plants in Italy.....	324
Table 8-12: Utilisation of geothermal energy for electric power generation in Italy .....	324
Table 8-13: Targets, national and regional objectives for direct use geothermal in Italy .....	328
Table 8-14: Utilisation of geothermal energy for direct heat in the Netherlands.....	332
Table 8-15: Utilisation of geothermal energy for direct heat (other than heat pumps) in Poland .....	335
Table 8-16: Geothermal power generation plants in The Azores, Portugal.....	336
Table 8-17: Utilisation of geothermal energy for electric power generation in Portugal*.....	337
Table 8-18: Utilisation of geothermal energy for direct heat in Portugal (other than heat pumps) .....	338
Table 8-19: Utilisation of geothermal energy for direct heat in Romania (other than heat pumps) ....	340
Table 8-20: Utilisation of geothermal energy in Russia for power generation .....	343
Table 8-21: Utilisation of geothermal energy for direct heat (other than heat pumps) .....	350
Table 8-22: Geothermal power plants in Turkey.....	355
Table 8-23: Turkish feed-in tariffs .....	355



Table 8-24: Turkey’s district heating systems.....	357
Table 8-25: Geothermal greenhouse heating in Turkey .....	358
Table 9-1: Present and planned production of electricity in Costa Rica .....	364
Table 9-2: Power generation plants in El Salvador.....	367
Table 9-3: Utilisation of geothermal energy for electric power generation in El Salvador .....	367
Table 9-4: Geothermal power generation plants in Guatemala .....	371
Table 9-5: Geothermal lease areas in Nicaragua .....	376
Table 9-6: Projects in the development stages in Nicaragua, 2010 .....	376
Table 10-1: Planned geothermal plants in Chile .....	382
Table 10-2: Feed-in tariffs in Ecuador.....	384
Table 11-1: Milestones for the Olkaria power plants in Kenya .....	392
Table 11-2: Summary of planned power plant developments .....	395
Table 11-3: KenGen ongoing projects with completion expected in the short-term .....	395
Table 11-4: Planned transmission projects in Kenya.....	396
Table 12-1: Geothermal manufactures .....	402
Table 13-1: Worldwide incentives for geothermal projects .....	406
Table 13-2: Worldwide incentives for geothermal projects .....	414

## Figures

Figure 2-1: Capacity factors for different renewable energy technologies .....	31
Figure 2-2: Various geothermal uses, including power generation and direct-use, related to their appropriate temperature range .....	33
Figure 2-3: Direct-use applications of geothermal energy .....	34
Figure 2-4: Leading Countries for Direct Use in MW, 2010 .....	35
Figure 2-5: GSHP principles .....	36
Figure 2-6: Loop designs for GSHP .....	37
Figure 2-7: Commercial application of ground source heat pumps .....	37
Figure 2-8: Geothermal power plant .....	38
Figure 2-9: Schematic Diagram of a Dry Steam Power Plant.....	39
Figure 2-10: Flash Steam Power Plant .....	39
Figure 2-11: The CalEnergy Navy I flash geothermal power plant at the Coso geothermal field.....	40
Figure 2-12: Binary Cycle geothermal power plant.....	40
Figure 2-13: The Mammoth Pacific binary geothermal power plants at the Casa Diablo geothermal field.....	41
Figure 2-14: Comparison of geothermal technologies .....	42
Figure 2-15: Volcanic Geothermal .....	45
Figure 2-16: Hot Sedimentary Aquifer (HSA).....	46
Figure 2-17: Enhanced Geothermal System.....	47
Figure 2-18: Hot Fractured Rock (HFR).....	48
Figure 2-19: Heat map indicating areas with temperatures suitable for EGS development.....	49
Figure 2-20: The schematic layout of the Soultz-sous-Forêts HDR plant .....	50
Figure 2-21: Example of cascaded geothermal resource for multiple uses.....	52
Figure 2-22: The geothermal resource .....	54
Figure 2-23: World high temperature geothermal areas .....	55
Figure 2-24: Geothermal resource utilisation potential .....	56
Figure 3-1: Development of direct use of geothermal energy, MWt, 1995 to 2010 .....	57
Figure 3-2: Development of geothermal direct use capacity by region, MW, 1995 to 2010 .....	58
Figure 3-3: Top ten countries in terms of installed direct use geothermal capacity.....	58
Figure 3-4: Share of direct use capacity by segment, 1995, 2005 and 2010 .....	62
Figure 3-5: Estimated global long term forecast of installed capacity for direct use geothermal, GWth, 2020 to 2100 .....	63
Figure 3-6: Roadmap vision of direct use of geothermal heat by region, excluding ground source heat pumps, EJ per year, 2010 to 2050.....	64
Figure 3-7: Annual Number of Installed GSHPs Units in the top five European Markets 2003 to 2009E .....	70
Figure 3-8: Installed GSHP and geothermal heat capacity, MWt, 2005 to 2010 .....	71
Figure 3-9: Average GSHP size in Europe, kW, 2005 to 2009 .....	72
Figure 3-10: Geothermal heat pump stage of market development .....	72

Figure 3-11: Indication of IPCC SSREN projection of global geothermal heat produced by ground source heat pumps up to 2050, EJ per year, 2010 to 2050 ..... 73

Figure 3-12: Development of geothermal power generation capacity, MW, 1990 to 2010 ..... 73

Figure 3-13: Development of geothermal power generation capacity by region, MW, 1990 to 2010... 74

Figure 3-14: Geothermal power generation installed capacity in countries with more than 100 MW installed, 2000, 2005 and 2010 ..... 78

Figure 3-15: Top ten countries in terms of projected new capacity additions, MW, 2010 to 2015 ..... 79

Figure 3-16: Installed capacity in the top ten markets, MW, 1990 to 2015..... 80

Figure 3-17: Markets driving geothermal growth ..... 82

Figure 3-18: Installed geothermal capacity worldwide, end 2009 ..... 83

Figure 3-19: Forecasting the installed capacity in 2015 ..... 83

Figure 3-20: Electricity generating capacity from geothermal energy, MW, 1975 to 2015 ..... 84

Figure 3-21: Actual and projected installed geothermal electrical capacity, 1995 - 2100 ..... 85

Figure 3-22: Actual and projected growth in global installed geothermal capacity, GW, 1995 to 2100 85

Figure 3-23: Projected installed geothermal capacity to 2030, GW..... 86

Figure 3-24: Growth of geothermal power capacities by technology, GW, 2010 to 2050 ..... 86

Figure 3-25: Potential geothermal energy resources split into categories e.g. theoretical, technical, economic, developable and existing supplies for power generation and direct use..... 87

Figure 3-26: Geothermal plant installed capacity by technology ..... 88

Figure 4-1: Operating capacity of developers of geothermal projects ..... 90

Figure 4-2: Location of Alterra Power Corporation’s electricity generation assets in operation or under development..... 91

Figure 4-3: Alterra’s planned rollout of renewable energy projects, MW, 2010 to 2016..... 92

Figure 4-4: Conceptual geothermal production capacity growth in Iceland, MW, 2010 to 2016 ..... 93

Figure 4-5: Production of electricity from Calpine’s geyser geothermal projects..... 95

Figure 4-6: Calpine’s geothermal plants ..... 96

Figure 4-7: Chevron’s geothermal assets ..... 98

Figure 4-8: Location of Contact Energy’s projects under development ..... 100

Figure 4-9: Contact Energy’s planned CAPEX investments ..... 101

Figure 4-10: Gradient Resources’ geothermal power project pipeline ..... 103

Figure 4-11: Hot Rock’s geothermal projects..... 104

Figure 4-12: Location of Mighty River Power’s New Zealand geothermal assets ..... 106

Figure 4-13: Mighty River Project’s projects in the US and Chile through GeoGlobal Energy and EnergySource ..... 107

Figure 4-14: Nevada Geothermal Power’s geothermal projects under development..... 108

Figure 4-15: Nevada Geothermal Power’s Blue Mountain leases ..... 110

Figure 4-16: Ormat’s projects worldwide as of September 2010 ..... 111

Figure 4-17: Panax Geothermal’s geothermal projects ..... 116

Figure 4-18: Ram Power geothermal projects in North America ..... 120

Figure 4-19: Location of Terra-Gen Power’s electric generation assets ..... 123

Figure 4-20: Location of Geodynamics' Cooper Basin geothermal projects .....	125
Figure 4-21: Comparison of the two types of projects Geodynamics is developing .....	126
Figure 4-22: GreenFire Energy's CO2ETM technology .....	127
Figure 4-23: Halliburton's geothermal projects worldwide .....	129
Figure 4-24: Iceland Drilling's drilling fleet .....	130
Figure 4-25: Potter Drilling's technology .....	131
Figure 5-1: Financing for a geothermal electric project for a 20 MW site, EUR million .....	139
Figure 5-2: Investment cost of renewable energy technologies, USD 1,000 per MW .....	141
Figure 5-3: Current estimate cost of 100 MW geothermal development .....	142
Figure 5-4: Completed geothermal well costs as a function of depth .....	142
Figure 5-5: Renewable Energy cost trend for geothermal, USD 2005 .....	144
Figure 5-6: Range of reduction of average levelised costs of electricity production in hydrothermal flash plants and binary plants, USD per MWh, 2010 to 2050 .....	144
Figure 6-1: Map showing example of in-place geothermal energy for 6-7 km depth across Canada	147
Figure 6-2: Development of Direct Use Geothermal Power in Canada, MW .....	149
Figure 6-3: Units of ground source heat pumps installed per year in Canada .....	151
Figure 6-4: Development of Geothermal Capacity in Mexico, MW .....	154
Figure 6-5: Total investment in geothermal in Mexico, USD million .....	156
Figure 6-6: Location of main geothermal fields, zones and sites in Mexico .....	157
Figure 6-7: Development of Direct Use Geothermal Power in Mexico, MW .....	159
Figure 6-8: Development of Geothermal Capacity in the United States, MW .....	160
Figure 6-9: Geothermal generating capacity online in USA by state, MW, April 2011 .....	161
Figure 6-10: NCPA Power Plant 2 at the Geysers, Winter 2005 .....	162
Figure 6-11: New installed geothermal capacity in the USA, MW, 2005 to 2010 .....	163
Figure 6-12: Total number of confirmed geothermal projects and prospects in the US, April 2006 to 2011 .....	163
Figure 6-13: Capacity by project stage in the US, MW .....	164
Figure 6-14: Number of projects at stages 1 to 4 by US state .....	165
Figure 6-15: Projects in the advanced phase of development by US state, MW .....	165
Figure 6-16: Projects in the advanced phase of development in the US, MW, 2006 to 2011 .....	166
Figure 6-17: Operating and installed geothermal capacity in the US by operator, MW .....	187
Figure 6-18: US operating and development of capacity of major industry participants .....	188
Figure 6-19: Project capacity in the US at stage 4 by operator, MW .....	189
Figure 6-20: Projected installed geothermal capacity in the US, MW, 2011 to 2017 .....	189
Figure 6-21: Geothermal Resources in the United States .....	199
Figure 6-22: Units geothermal heat pump shipments in the United States, 1999 to 2009 .....	200
Figure 6-23: US sales of GSHP units per year, 1999 to 2010E .....	200
Figure 6-24: US geothermal heat pump shipments by model type, units, 2000 to 2009 .....	202
Figure 6-25: Development of Direct Use Geothermal Power in the United States, MW .....	203

Figure 6-26: US geothermal direct use projects and resource areas .....	203
Figure 6-27: Geothermal Technologies Programme's ARRA funding .....	206
Figure 6-28: State or Federal Renewable Standards as of June 2011 .....	211
Figure 7-1: Development of Geothermal Capacity in Australia, MW .....	213
Figure 7-2: Estimated crustal temperature at 5 km depth.....	214
Figure 7-3: Australian geothermal licence areas and acreage releases at January 2011 .....	215
Figure 7-4: Development of Direct Use Geothermal Power in Australia, MW .....	220
Figure 7-5: Development of Geothermal Capacity in China, MW .....	221
Figure 7-6: Development of Direct Use Geothermal Power in China, MW .....	223
Figure 7-7: Geothermal provinces in India.....	227
Figure 7-8: Development of Direct Use Geothermal Power in India, MW .....	228
Figure 7-9: Development of Geothermal Capacity in Indonesia, MW .....	229
Figure 7-10: Geothermal in Indonesia .....	230
Figure 7-11: Geothermal resources in Indonesia.....	232
Figure 7-12: Location map of Indonesian Geothermal Resources and its installed capacity .....	235
Figure 7-13: Development of Direct Use Geothermal Power in Indonesia, MW .....	247
Figure 7-14: Development of Direct Use Geothermal Power in Iran, MW .....	248
Figure 7-15: Development of Direct Use Geothermal Power in Israel, MW .....	248
Figure 7-16: Development of Geothermal Capacity in Japan, MW .....	249
Figure 7-17: Geothermal power generation plants in Japan.....	251
Figure 7-18: Location of geothermal resources .....	254
Figure 7-19: Development of Direct Use Geothermal Power in Japan, MW .....	255
Figure 7-20: Development of Direct Use Geothermal Power in Jordan, MW .....	256
Figure 7-21: Development of Direct Use Geothermal Power in Korea, MW .....	257
Figure 7-22: Development of Direct Use Geothermal Power in Mongolia, MW .....	258
Figure 7-23: Development of Direct Use Geothermal Power in Nepal, MW.....	259
Figure 7-24: Development of Geothermal Capacity in New Zealand, MW .....	259
Figure 7-25: Historical and projected growth in geothermal electricity generation in New Zealand...	260
Figure 7-26: Total investments in geothermal in New Zealand, USD million .....	264
Figure 7-27: Development of Direct Use Geothermal Power in New Zealand, MW .....	265
Figure 7-28: Utilisation of geothermal energy for direct heat (other than heat pumps) in New Zealand .....	266
Figure 7-29: Geothermal direct heat uses in New Zealand, MW .....	266
Figure 7-30: Map showing the main uses of geothermal fluids in New Zealand, and showing the five geothermal regions .....	267
Figure 7-31: Assessment of restricted geothermal potential .....	268
Figure 7-32: Map of New Zealand geothermal fields .....	269
Figure 7-33: Map of geothermal fields in the Taupo Volcanic Zone .....	270
Figure 7-34: Development of Geothermal Capacity in Papua New Guinea, MW .....	271

Figure 7-35: Development of Direct Use Geothermal Power in Papua New Guinea, MW ..... 272

Figure 7-36: Development of Geothermal Capacity in the Philippines, MW ..... 273

Figure 7-37: Geothermal Service Contract Areas of the Philippines ..... 275

Figure 7-38: Location map of producing geothermal areas in the Philippines ..... 276

Figure 7-39: Identified geothermal prospects for advance exploration and/or field development ..... 281

Figure 7-40: Development of Direct Use Geothermal Power in the Philippines, MW ..... 282

Figure 7-41: Development of Direct Use Geothermal Power in Tajikistan, MW ..... 283

Figure 7-42: Development of Geothermal Capacity in Thailand, MW ..... 284

Figure 7-43: Development of Direct Use Geothermal Power in Thailand, MW ..... 285

Figure 7-44: Development of Direct Use Geothermal Power in Vietnam, MW ..... 286

Figure 7-45: Development of Direct Use Geothermal Power in Yemen, MW ..... 286

Figure 8-1: Development of Direct Use Geothermal Power in Albania, MW ..... 287

Figure 8-2: Development of Direct Use Geothermal Power in Armenia, MW ..... 288

Figure 8-3: Development of Geothermal Capacity in Austria, MW ..... 289

Figure 8-4: Development of Direct Use Geothermal Power in Austria, MW ..... 290

Figure 8-5: Development of Direct Use Geothermal Power in Belarus, MW ..... 291

Figure 8-6: Development of Direct Use Geothermal Power in Belgium, MW ..... 292

Figure 8-7: Development of Direct Use Geothermal Power in Bosnia, MW ..... 293

Figure 8-8: Development of Direct Use Geothermal Power in Bulgaria, MW ..... 293

Figure 8-9: Development of Direct Use Geothermal Power in Croatia, MW ..... 294

Figure 8-10: Development of Direct Use Geothermal Power in the Czech Republic, MW ..... 296

Figure 8-11: Development of Direct Use Geothermal Power in Denmark, MW ..... 297

Figure 8-12: Geothermal licences in Denmark ..... 298

Figure 8-13: Map showing the existing plant locations and the principal structural elements in Denmark ..... 299

Figure 8-14: Total investment in geothermal in Denmark, USD million ..... 300

Figure 8-15: Development of Direct Use Geothermal Power in Estonia, MW ..... 301

Figure 8-16: Development of Direct Use Geothermal Power in Finland, MW ..... 301

Figure 8-17: Development of Geothermal Capacity in France MW ..... 302

Figure 8-18: Soultz-sous-Forêts Project Overview ..... 303

Figure 8-19: Development of Direct Use Geothermal Power in France, MW ..... 304

Figure 8-20: Development of Direct Use Geothermal Power in Georgia, MW ..... 305

Figure 8-21: Development of Geothermal Capacity in Germany, MW ..... 305

Figure 8-22: Development of Direct Use Geothermal Power in Germany, MW ..... 309

Figure 8-23: Development of Direct Use Geothermal Power in Greece, MW ..... 311

Figure 8-24: Development of Direct Use Geothermal Power in Hungary, MW ..... 313

Figure 8-25: Development of Geothermal Capacity in Iceland, MW ..... 315

Figure 8-26: Installed capacity and generation in public power plants in Iceland, MW per GWh per percent, 2000 to 2009 ..... 316



Figure 8-27: Development of Direct Use Geothermal Power in Iceland, MW .....	319
Figure 8-28: One of the geothermally heated swimming pools in Iceland .....	320
Figure 8-29: Development of Direct Use Geothermal Power in Ireland, MW .....	322
Figure 8-30: Development of Geothermal Capacity in Italy, MW .....	323
Figure 8-31: Development of Direct Use Geothermal Power in Italy, MW .....	327
Figure 8-32: Development of Direct Use Geothermal Power in Latvia, MW .....	329
Figure 8-33: Development of Direct Use Geothermal Power in Lithuania, MW .....	330
Figure 8-34: Development of Direct Use Geothermal Power in Macedonia, MW .....	331
Figure 8-35: Development of Direct Use Geothermal Power in the Netherlands, MW .....	332
Figure 8-36: Development of Direct Use Geothermal Power in Norway, MW .....	333
Figure 8-37: Development of Direct Use Geothermal Power in Poland, MW .....	334
Figure 8-38: Geothermal sites in Poland .....	334
Figure 8-39: Development of Geothermal Capacity in Portugal & the Azores, MW .....	336
Figure 8-40: Development of Direct Use Geothermal Power in Portugal & the Azores, MW .....	338
Figure 8-41: Development of Direct Use Geothermal Power in Romania, MW .....	340
Figure 8-42: Development of Geothermal Capacity in the Russian Federation, MW .....	342
Figure 8-43: Some geothermal areas in the Russian Federation .....	344
Figure 8-44: Development of Direct Use Geothermal Power in Russia, MW .....	345
Figure 8-45: Development of Direct Use Geothermal Power in Serbia, MW .....	346
Figure 8-46: Development of Direct Use Geothermal Power in the Slovak Republic, MW .....	347
Figure 8-47: Development of Direct Use Geothermal Power in Slovenia, MW .....	348
Figure 8-48: Localities with geothermal direct heat use in Slovenia .....	349
Figure 8-49: Development of Direct Use Geothermal Power in Spain, MW .....	350
Figure 8-50: Development of Direct Use Geothermal Power in Sweden, MW .....	351
Figure 8-51: Development of Direct Use Geothermal Power in Switzerland, MW .....	353
Figure 8-52: Development of Geothermal Capacity in Turkey MW .....	354
Figure 8-53: Development of Direct Use Geothermal Power in Turkey, MW .....	356
Figure 8-54: Locations of major geothermal fields, district heating and greenhouse installations and young volcanoes .....	358
Figure 8-55: Development of Direct Use Geothermal Power in the Ukraine, MW .....	359
Figure 8-56: Development of Direct Use Geothermal Power in the United Kingdom, MW .....	360
Figure 9-1: Development of Direct Use Geothermal Power on the Caribbean Islands, MW .....	362
Figure 9-2: Development of Geothermal Capacity in Costa Rica, MW .....	363
Figure 9-3: Geothermal resources in Costa Rica .....	364
Figure 9-4: Map of geothermal development in Costa Rica .....	365
Figure 9-5: Development of Direct Use Geothermal Power in Costa Rica, MW .....	366
Figure 9-6: Development of Geothermal Capacity in El Salvador, MW .....	367
Figure 9-7: Development of Direct Use Geothermal Power in El Salvador, MW .....	369
Figure 9-8: Development of Geothermal Capacity in Guatemala, MW .....	370

Figure 9-9: Geothermal fields in Guatemala ..... 371

Figure 9-10: Development of Direct Use Geothermal Power in Guatemala, MW ..... 372

Figure 9-11: Development of Direct Use Geothermal Power in Honduras, MW ..... 373

Figure 9-12: Development of Geothermal Capacity in Nicaragua, MW ..... 374

Figure 10-1: Development of Geothermal Capacity in Argentina, MW ..... 379

Figure 10-2: Development of Direct Use Geothermal Power in Argentina, MW ..... 380

Figure 10-3: Development of Direct Use Geothermal Power in Brazil, MW ..... 381

Figure 10-4: Development of Direct Use Geothermal Power in Chile, MW ..... 383

Figure 10-5: Development of Direct Use Geothermal Power in Colombia, MW ..... 384

Figure 10-6: Development of Direct Use Geothermal Power in Peru, MW ..... 386

Figure 10-7: Development of Direct Use Geothermal Power in Venezuela, MW ..... 386

Figure 11-1: Development of Direct Use Geothermal Power in Algeria, MW ..... 387

Figure 11-2: Development of Direct Use Geothermal Power in Egypt, MW ..... 388

Figure 11-3: Development of Geothermal Capacity in Ethiopia, MW ..... 389

Figure 11-4: Development of Direct Use Geothermal Power in Ethiopia, MW ..... 390

Figure 11-5: Development of Geothermal Capacity in Kenya, MW ..... 391

Figure 11-6: Geothermal areas in the East African Rift Valley ..... 393

Figure 11-7: Development of Direct Use Geothermal Power in Kenya, MW ..... 397

Figure 11-8: Development of Direct Use Geothermal Power in Morocco, MW ..... 398

Figure 11-9: Development of Direct Use Geothermal Power in South Africa, MW ..... 398

Figure 11-10: Development of Direct Use Geothermal Power in Tunisia, MW ..... 400





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